

THE 2008 STRATEGIC PLAN AND REPORT

TO THE CALIFORNIA AIR RESOURCES BOARD

ON MEETING AB 32 FORESTRY SECTOR TARGETS



**THE BOARD OF FORESTRY
AND FIRE PROTECTION**

GOVERNOR

ARNOLD SCHWARZENEGGER

SECRETARY OF THE RESOURCES AGENCY

MICHAEL CHRISMAN

**MEMBERS OF THE CALIFORNIA
STATE BOARD OF FORESTRY AND FIRE PROTECTION**

STAN L. DIXON, CHAIR

PAM GIACOMINI, VICE CHAIR

LLOYD BRADSHAW

GARY NAKAMURA

DAVID NAWI

DR. DOUGLAS PIIRTO

JAMES OSTROWSKI

BRUCE SAITO

THOMAS WALZ

1. Introduction:

The Global Warming Solutions Act (AB32) directs greenhouse gas (GHG) emissions be reduced by 2020 to the State's 1990 levels. As part of this directive, a Scoping Plan was devised that will serve as the State's roadmap for achieving these emissions reductions, with broad goals and defined measures for 10 industry sectors. The forest sector Scoping Plan strategy is a "No Net Loss" target, that is, to achieve reductions equivalent to the current statewide forest carbon budget. This target is based on the current 2004 GHG inventory, which shows a roughly 5 million metric tons (MMT) CO₂e net uptake in the forest sector. The target requires the forest sector, through the Board of Forestry and Fire Protection, to develop a plan (measures) to maintain current sequestration levels in a forest environment that is at risk of losses from land-use change, catastrophic disturbance (such as wildfire, insects and disease), and reduced management levels. (See Appendix 1) The 5 MMT target is a minimum goal for the forest sector, but the sector has the potential to achieve a greater amount of carbon sequestration and offsets.

While the California Air Resources Board (ARB) is ultimately responsible for achieving the reductions, the California Board of Forestry and Fire Protection (the Board) has the authority – and expertise – to develop, revise and implement regulations and programs to assure that the forest sector target is met. The Board believes that the 5 MMT target can be met, and surpassed, through a combination of regulatory, statutory and incentive-based approaches. These approaches include:

- Improvement of forest inventory and monitoring to ensure changes will be detected.
- Consideration of additional statutory and regulatory needs, including a review of the effects of existing regulations on carbon sequestration.
- Working with Federal agencies to maintain and increase sequestration levels by: 1) preventing losses of inventory and growth rates; 2) continuing reforestation efforts; and 3) fuels management treatments on federal lands to reduce the risk of catastrophic wildfire.
- Reducing barriers and providing additional incentives to encourage voluntary action by private landowners to increase inventory and growth rates while decreasing risk of losses.
- Developing sound policies and regulations for CALFIRE that will contribute to reduction of the risk of catastrophic wildfire.
- Encouraging research related to climate change impacts for the Forestry Sector.
- Working with other agencies and legislative authorities to ensure development of policies, infrastructure and funding to support fuels reduction and biomass utilization.

The Board is mandated to maintain a vigorous, resilient and healthy forest land base in California, which supports the ecological needs of the forest ecosystem and its human dependencies. The Board recognizes the importance of the sequestration potential for forests and their benefits in achieving GHG emission reduction targets. At the same time the Board acknowledges that these needs must be considered in conjunction with the many other ecological and human benefits that forests provide and for which the Board has responsibility in this State.

The intent of this strategic plan is to establish an approach that establishes a framework for action to maintain the 5MMT target within the context of the Board's California forest policy. Further analysis is saved for a more detailed implementation plan, which is

expected to emerge as a result of one or more task groups planned to address the work plan outlined in this guidance document (see section 6).

To meet the goal of "No Net Loss" and to meet or exceed the 5 MMT CO₂eq target the Board of Forestry plans to implement a program for managing forest carbon based on, 1) Improvement of existing inventory of carbon stocks together with a credible monitoring program, 2) the use of voluntary programs and incentives to maximize landowner participation in programs that enhance carbon sequestration, 3) a review of the effects on carbon sequestration of existing regulations and consideration of new amended regulations as a potential means of meeting the target, if needed, and 4) encourage research and suggest legislation related to climate change impacts for the Forest Sector.

2. Forest Sector

California is comprised of a diverse landscape of over 100 million acres. Thirty-three million acres are characterized as forest. Across the 33 million acres of California's forests, there is a broad range of forest types and species. Forestland ownership and management is also diverse. The area of forests in California is split roughly evenly between private and public ownership, 45% is private, 52% is federal, and 3% is State or Local government. Management of the forest carbon pool is strongly influenced by land ownership goals.

The Forest Sector is unique in that it is the only sector that removes CO₂ from the atmosphere and sequesters it over the long-term. Carbon sequestration is the process by which atmospheric carbon dioxide is absorbed by trees through photosynthesis and stored as carbon in trunks, branches, foliage, roots and soils. Forests are both a sink (storage place) and a source of CO₂. Carbon storage in forests and wood products provide a carbon sink, while decay and wildfire ultimately release the absorbed carbon under the natural cycle of forest growth, senescence and regeneration. The Forest Sector represents complex biological systems that are inherently highly variable and difficult to quantify and predict. Furthermore, forests are anticipated to respond to climate change in complex and uncertain ways. It will be challenging to manage forests to enhance sequestration capacity across a landscape that is, itself, changing in response to climate.

Carbon dioxide emissions for the forest sector in 2004 were estimated at approximately 4.9 MMT from disturbances such as fires and harvesting, and 4.5 MMT from the decomposition of forest products in landfills and composting facilities. Atmospheric CO₂ removal by forests was estimated at -14.1 MMT (the minus sign denotes removal of CO₂ from the atmosphere). Taken together, atmospheric CO₂ removals and emissions represent a sector-wide net flux of approximately -4.7 MMT CO₂ for the combination of public and private lands. This -4.7MMT CO₂ is rounded to 5MMT CO₂ throughout the report. The uncertainty in this estimate is roughly $\pm 38\%$. This range of uncertainty is large and one of the major reasons that continued work on the Forest Sector portion of the GHG inventory is a high priority.

Sustainable forestry goals are consistent with long-term climate goals. Sustainable forestry practices also produce other benefits and ecosystem services, such as improved air, soil and water quality. However, some of these activities may appear to conflict with GHG emission reduction goals in the short term. For example, prescribed burning may increase short-term emissions, but reduce long term overall emissions and

produce larger net gains in forest health. Harvesting or brush clearing may cause short term emissions but these can be offset by increased regeneration, growth and utilization of wood products.

Forestry measures to increase carbon benefits may require funding, assistance and infrastructure. Carbon markets are one mechanism for providing an economic incentive for forest landowners to increase growth rates and maintain their lands as working forests. Carbon offset protocols have been established for forestry and utilized and verified on two projects for which carbon credits have been sold. Revisions to the protocols may be made as the process is refined. The California Climate Action Registry (CCAR) adopted an Urban Forestry protocol in August 2008, and a Forest Protocol Workgroup is updating the current CCAR protocols to include public lands and reduce barriers to participation. Drafts of these updates will be available in October or November 2008.

3. Board of Forestry and Fire Protection Authority and Policies:

The Board of Forestry and Fire Protection has very broad statutes and responsibilities, including a role as a forest practice regulation entity, a role in setting the policy and the structure for fire protection in California, and also the responsibility to represent the State in Federal forestry issues. To meet or exceed the 5 MMT CO₂eq target the Board of Forestry and Fire Protection plans to implement a program for managing forest carbon based on the following approach:

1. Monitor progress towards the goal and improve estimates of forest carbon and emissions from wildfires;
2. Use voluntary programs and incentives to maximize landowner participation in programs that enhance carbon sequestration, reduce emissions from wildfires, or promote utilization of forest biomass;
3. Review the effectiveness of existing regulations and consider new regulations as a possible way to help meet the target goal;
4. Encourage research and suggest legislation related to climate change impacts for the Forest Sector.

The Board has a number of means to institute direct policy. These include:

1. The Board 2007 Policy Statement,
2. Adoption of Regulations (Forest Practice Rules, Regulations for other Resource Management Programs, Fire Prevention and Administration),
3. Specific topical Board Policy Statements (Forest Pests, Forest Research, Range Improvement, Fire Protection, Fire Plan, etc.),
4. Joint Policies with Collaborating Agencies (Joint Policy on Salmonids, Joint Policy on Hardwoods, etc.),
5. The California Fire Plan, and
6. The Board Standing Committee on Policy.

The current policies of the Board can be found on the web at:

http://www.fire.ca.gov/CDFBOFDB/board/board_policies.asp

Most significantly the Board 2007 Policy Statement contains seven criteria, each with a set of objectives, indices, and strategies against which success can be measured. Of the seven goals, five address climate change directly or indirectly.

4. Department of Forestry and Fire Protection – Current Programs:

California has a history of closely regulating forest practices on private land, encouraging forest management, and providing aggressive fire suppression. These initiatives are facilitated through a variety of strategies and incentive programs including landowner assistance, research and demonstration, technical assistance and regulation. Examples of successful approaches are the Forest Practice Act, Timber Tax Reform Act, and annual wildland fire protection. These have led to a variety of mandated and voluntary actions that account for significant carbon benefits today. The highest priorities for programs with a nexus to climate change mitigation include those around reducing catastrophic fire and the appropriate links with biomass energy. Biomass energy opportunities for forest fuels reduction efforts are gaining traction in the State. Additional State funding was recently released to the Sierra region for better biomass utilization, and the California Energy Commission announced funding for biomass energy programs. The California Fire Plan is in the process of being updated, which provides an opportunity to include climate change issues and opportunities.

Table 1 - Land Management Practices Currently Employed That Reduce Air Pollution and Provide Additional Environmental Benefits.

FOREST PROGRAMS	DESCRIPTION
Forest Stand Management	Forest landowners manage forest stands in a variety of ways that differ in carbon sequestration outcomes (e.g., choice of tree species planted, length of harvest rotation).
Best Management Practices	Forest management actions from existing Best Management Practices are designed to protect water quality, and wildlife habitat, and provide a broad range of environmental benefits.
Managing for Forest Carbon	As the voluntary carbon market develops forest landowners following CCAR protocols can be compensated for sequestering additional carbon. Currently, two landowners have gone through verification and are able to sell carbon credits.
Reforestation / Afforestation	Industrial forestland owners have historically reforested those areas damaged by wildfire that have higher growth.
Conservation Easement	Conservation easements are commonly used in California to protect forests from development and other forms of land conversion. There are differing management objectives, but in most cases conservation easements protect existing and promote additional forest carbon.
Environmental Protection	These activities protect the overall health of a forest and help maintain the existing forest carbon pool. These include provisions for watershed protection. Environmental protection activities have interactions with local, state and federal agencies on projects that impact forest and rangeland, and

	assist in developing mitigations to reduce risk and increase forest health.
Forest Health	Actions taken by landowners to address forest health help reduce the risk of losses in forest acreage and the subsequent decrease in the overall forest carbon pool.
Wood Utilization	Identify and encourage opportunities for new wood product businesses in the State, including round wood, reconstituted wood products, chemicals, and bioenergy.
Wildlands Fuels Management	These actions include thinning, prescribed burning and other forms of vegetation management. Vegetation treatments temporarily reduce forest biomass and forest carbon, but these actions help reduce emissions by lowering the frequency and extent of high severity wildfires.
Urban Forestry	Many cities and organizations are actively involved in tree planting to expand the role of urban forests. In Wildland Urban Interface (WUI) areas, individual land owners are also engaged in tree planting and various forms of vegetation management that can affect forest carbon sequestration and energy savings.
Fire Plan	The Board approves a plan that provides adequate fire protection according to the type of lands protected. (PRC § 4130). The plan addresses pre, during, and post fire activities and is to assure the same intensity of fire protection for all State Responsibility Lands (SRA).
Fire Engineering	Fire engineering for the wildland addresses 1) removing or reducing the heat source, 2) modifying or reducing the fuels near structures, and 3) modifying the act or omission allowing the heat source to come into contact with ignitable fuels. The net effect is a reduction in the risk of large wildfires.
OSFM – Building Standards	Fire resistant building standards have been developed to help reduce losses from wildfire, as well as prevention of the spread of fire from rural communities into the forests and wild lands.

5. **Forest Sector Climate Strategies:**

Five strategies were identified through the Climate Action Team and ARB stakeholder process. Within these broad categories, specific actions were described that would provide opportunities to exceed the 5 MMT target, providing a safety net in the event of catastrophic carbon reversal. Alternatively, these actions can be seen as a chance to enhance the economic opportunities and ecological co-benefits of the forest sector by stretching beyond the 5 MMT minimum and demonstrating the full capability of the forest sector. These five strategies are as follows:

1. Reforestation and Afforestation – The forest sector has strong emission reduction potential in both the short and long-term. Re- and Afforestation are great examples where investment in the short-term will provide enormous benefits in the 2050 timeframe from a combination of the CFIP program, state and federal re- and afforestation, mitigation and offsets. This strategy may provide more than 23 MMTCO₂E per year by 2050. The GHG benefits of this strategy in the short-term, however, are small. Removal and utilization of dead trees, where appropriate, has an immediate effect in reducing

carbon emissions from decay and fuel for future fires. It is also essential for the long term success of reforestation after stand replacing disturbances.

2. Fuels management – The most significant potential short-term reductions come from using residual forest wood waste from thinning, harvesting and urban forestry practices to displace fossil fuel in energy generation. Annual savings by 2020 are calculated to be 4.2 MMTCO₂E. Reducing fuel loads where appropriate on state and federal lands and using that biomass for energy generation significantly reduces GHG emissions by reducing the risk of wildfire and displacing emissions from fossil fuels. This helps meet the growing demand for renewable energy sources and the state's bio-power objectives, including the Renewable Portfolio Standard. The removal of fire-hazardous fuels from forests, when applied appropriately, has the dual benefit of reducing the frequency and magnitude of wildfire and the associated emissions. While the benefits of displaced fossil fuel use come from activities in the forest sector, the emission reductions are counted in the energy sector.

3. Urban forestry – Trees planted in urban areas through state and voluntary programs not only sequester CO₂, but also provide energy savings through the cooling effects of shade, as well as providing multiple co-benefits.

4. Conservation – Proposition 40, 50, and 84 funds have or will purchase conservation easements in forest lands to protect them from development. More proposition funds in the future would maintain these actions. Approaches that maintain working forests are the preferred utilization method for acquiring conservation easements. They total 1.4 MMT annually in 2020.

5. Forest management– Increased intensity of forest management that improves forest health, stocking levels and forest growth rates all have the potential to increase carbon sequestration and reduce emissions in the short and long term. Existing rules that require Maximum Sustained Production will ensure the short and long term carbon sequestration benefits of increased forest inventory and wood product production. These activities may be incentivized by the carbon offset market.

6. Board of Forestry and Fire Protection Work Plan:

A. Goals The plan has two goals: 1) to maintain a net carbon sink of 5mmt Co₂ in the forest sector, and 2) to reduce the uncertainty surrounding maintenance of the sink. The Board has attached Appendix 1 to provide an overview of the types of uncertainties that need to be addressed along with possible solutions to that uncertainty.

B. Principles: The following principles for managing forest carbon are intended to guide policy choices and to formulate effective strategies. These principles are designed to preserve and enhance carbon stocks in both standing forests and wood products. The cycling of carbon between forests and the atmosphere consists of carbon stored and transferred among various pools. Principles that guide management need to recognize that optimal carbon storage may be achieved by enhancing forest stocks, by increasing longevity and reuse of wood products, and by reducing losses from disturbance from insects, pathogens, and wildfires.

Protection and Conservation –

The over-arching consideration for the forest sector is to protect and conserve forest land by keeping forests as working forests and reserves. The three major agents of change in a California's forest are wildfire, insects and disease, and human development/use. For wildfire, protection takes the form of active fire suppression and related programs by Cal FIRE, federal and local agencies to protect life, property, and natural resources. In the case of forest insects and disease, which often is greater than losses to wildfire, protection occurs in the removal of damaged timber, quarantines, and application of pest control measures. With regard to the impacts of development/use, protection takes many forms such as zoning to keep land in forest production, tax policies that favor timber growing, and limits on forest land conversion to non-forest uses. Conversions are especially important because they reduce or minimize the carbon storage potential of a parcel(s) of land, fracture biological habitats, interrupt natural hydrologic regimes, and are associated with increases in air pollution through higher population densities.

Resilience –

Climate change in the forest sector has the potential to alter disturbance regimes by affecting the timing, frequency, and magnitude of wildfires, pest infestations, and other agents of disturbance (Dale et al, 2001). The resiliency of a forest refers to its ability to recover from disturbance and is a measure of the overall health of a forest. Improving forest and range resiliency means that systems are better able to maintain storage of carbon and resist extreme climatic events. Obtaining better resiliency requires forest management that, among other things, promotes a diverse mix of tree species, a broad range of age classes, and maintains optimum densities for forest health and growth. Promoting resilience increases the ability of a system to withstand negative impacts without losing its basic functions.

Restoration –

Restoration means returning lands to a condition that maintains healthy productive forests. This includes reforestation of lands burned by wildfire, addressing invasive species and other vegetation management actions that restore degraded forest lands. For example, the United States Forest Service estimates a minimum backlog of 80,000 acres of areas burned that have not been treated with reforestation. This number has increased substantially with the recent fires in Northern California and may well be several times larger than this. Re-planting these lands will increase carbon sequestration in forests. In addition, as trees grow and mature they provide habitat for wildlife and other co-benefits.

Utilization –

Use of forests and forest products can be made more carbon sensitive. Harvesting results in an initial decrease in the amount of standing carbon in a forest stand. However, the fate of the carbon depends on the type of forest products that are produced. Promoting the use of long lived wood products can support carbon sequestration goals, provided that it is produced sustainably. In addition, as building materials and an energy source, wood can substitute for more energy-intensive materials and fossil fuels.

Mitigation –

Mitigation involves taking actions that will reduce or offset the negative effects of climate change. In the forest sector this involves management actions that increase carbon sequestration and actions that can lead to mitigating emissions. Mitigations can include a range of management actions that offset climate change impacts (i.e. reforestation, wood utilization, increased carbon sequestration).

Adaptation –

In nature, adaptation is part of a natural biological response of species or ecosystem to a changing environment. Humans can also take preventative actions to cope with climate change impacts. In the forest sector, adaptation is defined as actions that are undertaken to increase the capacity of forests, ecosystems and society to function productively and cope with impacts from climate change (modified from Millar, 2007). The goal of adaptation planning in forestry is to reduce the vulnerability of forests, or increase the resilience to climate changes and to improve the capacity of the forest sector to cope with impacts from climate change.

C. Actions: The Board's Research and Science Committee will form a special subcommittee on Climate Change, and assign responsibility to task groups to develop a plan for each subject area. These task groups will include experts from federal and state agencies, academia, and those with expertise from the stakeholder community. The Task Group(s) will report progress to the Board, share results and solicit input from the public through workshops, and develop an approach and action plan by the specified date. The role of these task groups is to flesh out the more specific plan that will be used by the Board and collaborators to meet the Scoping Plan target.

Managing Institutions –

- Estimate carbon benefits from specific regulatory actions and identify regulatory modifications needed to be compatible with achieving carbon target (Jan. 2010 – 2011).
- Identification of incentives and funding sources (Jan. 2010)
- Work with California Public Utilities, California Energy Commission, and other interested parties to develop additional carbon markets, or project funding sources (Jan. 2011).
- Forest Market Advisory (What is needed for the Forest Sector to be successful in current and future carbon markets) (Summer 2010)
- BOF will work with CEC, ARB, USFS, DOE And others to increase fuel reduction and biomass utilization (ongoing through 2020)
- Coordinate with Sierra Nevada Conservancy, other conservancies, and local planning agencies to address climate change and forest management.
- Provide guidance to community based organizations to include climate change issues in fire planning (Fire Safe Councils) and watershed management (IRWMP Irrigation and Water Management Plan?) (Jan. 2010).

Managing Ecosystems –

- Update of California Fire Plan to include risk-based approaches to fire management under climate change for mitigation (reduced GHG emissions) and adaptation (enhanced resiliency/reduced vulnerability) outcomes. The Plan will also address suppression strategies, and the impacts of those strategies on climate change. (December 2010).
- Review existing forest health programs, including those related to forest insects and disease, and develop approaches to strengthen such programs.
- Review programs and methods to increase productivity on public and private forestlands, including salvage and rehabilitation where fire, pest, or disease have reduced potential productivity.
- Review existing programs that relate to invasive species on forest and rangeland and develop approaches for improvement.
- Public & local Government Involvement - linking Board regulatory authority with CEQA regulatory authority under new climate change review requirements, especially in hardwood zones (Forest Land v. Timberland) (January 2011).
- Review Board Research Plan and consider basic and practical) results to guide adaptive management - (Initial recommendations January 2010).
 - Risk and vulnerability predictions, especially fire
 - Regional Climate Models
 - Species and Forest Type movement predictions
 - Forest insect, disease, invasive species, behavior and control
 - Predicted Ecosystem responses to climate models
 - Test/Pilot projects
- Identify Department and Cooperators resource needs for program implementation to contribute to GHG reductions and support actions needed to maintain target (above short-term or scoping target?). Assist where possible to fill those needs (April 2009).

Managing Information –

- Inventory/ Monitoring Improvement (Jan. 2010)
- Establish measures for assessing and tracking effectiveness of programs (Jan. 2012)
- Protocol Improvement Needs (Jan. 2011)
- Identification of measures to minimize risk of reversal (Jan. 2010)

- Public Outreach on importance of Climate Change and opportunities for various landowner classes to participate (Jan. 2010)
- Board will establish reporting and indicator methodology to assure progress for ARB.

7. Resource needs to accelerate GHG emission reductions.

A variety of funding sources could be utilized to implement forest sector measures. They include proposition bond funds, legislative procurement, carbon market, public goods charge, the California Carbon Trust funds from auctioning allowances, and federal funding if it becomes available. Funding for forest management (five strategies) with climate benefits could be considered a priority, primarily due to the cross-sector benefits that occur with the reduced emissions from fires, energy sector benefits, and the maintenance of the state's forest lands.

The cost of the actual treatments to implement the five forest strategies to capture the total additional sequestration potential from the forest sector is significant. The Department has done some analysis on the possible carbon benefits from each of the strategies and the associated costs to achieve those benefits. For example it is estimated that the five strategies has the potential to add roughly 8 mmtCo2 annually by 2020 with a cost within a range of \$28 – 35 million annually. This analysis shows that by 2050 the climate benefits from the five strategies are substantially greater. If actions are not commenced quickly these benefits will not be realized due to the long life cycles associated with forests. These numbers should be viewed with caution as they are based on a specific set of assumptions that only represent a snapshot in time. The estimates also, assume that the forecasted efforts would be successful within both the private and public institutions. To get a cost/benefit picture that will be supported in different policy making venues the Board and Department will have to invest additional time and effort to refine both cost and benefit estimates

Current programs need to be expanded and new tools such as various forest markets need to be developed to optimize achieving climate benefits that exceed the 5mmt target. Increasing the institutional capacity of the Board, the Department, and Federal land managers to implement their programs is essential to providing confidence that carbon benefits will meet and exceed the target. One of the most significant requirements to move forward is to be able to track carbon across forest ecosystems, an ability the Department no longer has. This needs to be re-established as part of any overall strategy. Absent any increase in capacity our ability to manage forest carbon will be limited and the full potential of California forests to contribute to provide a full suite of climate benefits will not be realized.

Two newly developing markets have the potential to create funds for implementation of the five (5) basic strategies. These are the carbon market and the bio-energy markets. The potential size of these markets is not clear but they are both estimated by market experts to potentially reach well into the billion dollar level. If these markets are successful, they will avoid a significant implementation expense for public funding sources. However, there is a high level of uncertainty as to who will be allowed participate in these markets and what role the forest sector will assume. The Board and Department will need to play an assertive collaborative role with state and federal agencies, and with private and other stakeholders to assure that these markets give full

consideration to the range of values provided by the Forest Sector. The Forest Sector needs to be provided a level playing field in both of these developing markets. It is incumbent upon ARB and the Board to implement policies and actions that lead towards this objective.

Should public funding be developed for this effort, it is essential that the distribution of funds ensure co-benefits are considered when allocating state resources. The Board has established resource protection regulations that apply to reforestation, vegetation management, and other program activities. These regulations will be reviewed to assure co-benefits are properly considered and maintained.

As noted above, to maximize the potential carbon sequestration from forest management activities will require a cooperative working relationship with management of state and federally owned forest lands. It is the responsibility of the Board to continue work with Federal land managers to increase their ability to utilize management practices that add to long-term carbon stocks.

8. Conclusion:

This report is intended to provide the Air Resources Board with a description of how the Board of Forestry will pursue actions that will result in the state's forestlands having a net sequestration rate of 5mmtCo₂ annually by 2020. A planned set of steps to achieve this objective are presented together with an outline of the capabilities of the Board to be successful in this effort. One of most imperative efforts will be the improvement of the state's forest inventory and monitoring system by 2016. A parallel critical factor to assure maintenance of this target past 2020 is development of a forest climate adaptation plan along with strategies for implementation.

The Board recognizes that none of these critical factors can be achieved by the Board alone and will establish and maintain a collaborative effort with the wide range of stakeholders needed to be successful in this effort.

To carry out this work plan, the Board has established a Special Committee of the Board on Climate Change that will work with the Research and Science Committee to form task groups to address each of these priority items. The committee will hold meetings at least quarterly to track progress and to report to the Board on any adjustments needed for the work plan. In return the Board will report to the ARB on progress. The approaches outlined here will require continual review and modification as new research is developed and inventory systems improve.

The approach outlined in this report will enhance ongoing actions that the Board is now taking on forest and rangelands in California. The Board believes that existing actions and programs that promote sustainable forest management are consistent with meeting the target set by ARB. The substantial uncertainties in managing forest carbon that have been outlined here and in the AB 32 Scoping Plan have existed for some time and yet the California forest is still an increasing net carbon sink. However, it is clear from the current increase in wildland fire events that improved forest health, fuels management and providing markets for that material will require immediate attention. Maintaining strong fire protection and prevention, fostering programs that improve forest resiliency and health, and promoting cooperation with stakeholders will be the key to success in the forest sector.

APPENDIX A UNCERTAINTIES TO BE ADDRESSED AND SOLUTIONS

Factors that may hinder meeting the Forest Sector Target (5MMT CO₂):

A number of factors challenge the sequestration potential of California's forests. These include:

- Risks of carbon reversal are factors that threaten the forest carbon storage capacity and come from both natural disturbances and from human behavior in forest management. Risks of carbon reversal due to natural disturbance increase with the advancing effects of climate change. Examples of disturbances include:
 - Increasing fires and fire damage due to past fire suppression and increased drought
 - Increasing insect and disease infestation from overstocking and drought conditions
 - Increased downstream runoff and flooding from fire-damaged upper watersheds
 - Changes in conifer regeneration and growth and decreased forest cover by century's end
 - Change in genetic diversity, loss of genetic legacy
 - Change in habitats, species distribution, and forest health
 - Increases in infestation from exotic or invasive species
- Management Risks
 - The impacts of climate change. Climate change itself raises the uncertainty about the impact and success of some established management practices. An example is the current planting of trees that may prove to be more intolerant of drought and climate extremes.
 - Cost of management. Over time, costs of clearing, reforestation, and other management practices have risen. Reasons for cost increases include such things as increases in the price of fuel, insurance and other payments and cost of equipment. If costs continue to rise, it may be more difficult to fund projects that improve and protect the sequestration of carbon in forests.
 - Lack of adequate project or investment funds. The ability to manage largely requires available funds to support reforestation, fuel hazard reduction, stand manipulation, and other things. Larger forest companies are investing out-of-state. Higher profits elsewhere, continued regulatory uncertainty, and other factors work against sustained investment in forest management by the private sector.
 - Land price and alternative uses. In many places in California, land is more valuable for other uses than it is for forestry or ranching. Examples of this include conversion of land to vineyards and home-sites. In this situation, there may be little incentive to expand forestry operations.
 - Consolidation and loss of utilization infrastructure which in some areas of the state has resulted in landowners having no opportunities to utilize saw logs from their property.
- Land Fills. Landfill storage emissions are becoming increasingly important as landfill wood product volume increases. The carbon-storage capacity of landfill wood waste is being considered by many groups. The associated emissions from landfill wood waste presents an issue for the forest sector as it appears to be one of the fastest growing emission sources in the Forest Sector (California Integrated Waste Management Board). The accounting of that emission falls in the forest sector due to precedent set by the IPCC – regardless, it will require cooperation with waste management agencies and entities to solve.
- Imports. Also under Management Risks, above. Solutions to this problem must be equitable.

- Wood Product Utilization. Improvements in re-use and recycling to energy or other products.
- Policy issues coordinating multiple agencies and entities around land-fill storage and emissions.
- Institutional and Market Factors—
 - Increased imports of wood products. California imports nearly 80 percent of its wood products. The carbon impacts associated with imported wood are not clearly understood. On the one hand these wood products represent stored and sequestered carbon. On the other hand these imported wood products represent a significant portion of the wood products related emissions from landfills. In terms of carbon accounting, these imported wood products represent a significant source of “leakage” from a GHG accounting perspective.
 - Cycles in timber prices – Historically timber markets are quite volatile as with most commodities. Timber markets occasionally cycle to where log prices are exceptionally high for species such as fir and pine. When this occurs there is pressure on landowners to join into the market before the down cycle takes hold. This can result in significant short-term increases in levels of harvest. However, in the longer term these stands will regain carbon removed due to the restocking and sustained yield components of the Board’s rules.
 - State policies toward forestry on private lands. The current array of state regulations and policies in California that affect private land in California do not provide sufficient incentives and economic returns for actions by landowners to increase investment in climate-related forest management. While tax policies encourage long term investment in forestry, forest practice and other environmental regulations on the timber industry substantially raise the cost of forest management and production in California compared to other places. This works against attracting private investment in forest management and needed infrastructure to process wood products.
 - Social and political conflicts have direct impacts on the ability to achieve the desired future condition of the states forests. The Board considered this issue in their 2007 Policy Report. In public opinion polls, an overwhelming majority view overall environmental problems such as air and water pollution, growth, traffic, and water supply as a threat to their health and well-being. Residents also believe that insufficient progress has been made over the past 20 years in solving environmental problems. Innovative strategies to address these concerns and communicate successful approaches to the public will continue to be required.
 - The natural resource agencies of the state are currently under tight fiscal constraints and limited in their ability to meet their missions and goals. Undertaking the new initiatives related to climate change is increasing this fiscal stress. Additional resources will be needed to provide incentives for landowners to undertake actions to mitigate for or adapt to climate change. Further resources will be needed for the agencies to dedicate effort to the research, technical assistance, protection, and policy development needed to address climate change issues with an acceptable level of competence.
 - Markets for forest carbon, woody biomass energy, and biofuels will need to be created and/or expanded in support of a number of policy initiatives such as the Renewable Fuels Standard (RFS) and the Renewable Portfolio Standard (RPS).

Possible Solutions:

The following is a list of possible solutions that can be used to reduce the uncertainty of meeting the goals of “no net loss”, the 5MMT CO₂eq target, and enhancing additional carbon sequestration.

- Regulatory Review – Consider additional Statutory and Regulatory needs such as increased mitigation for conversion. Other areas of opportunity may be modifications of exemptions from

portions of FPRs (define) that apply to fuel hazard reduction projects. The review should identify those areas where the greatest gains can be made in climate change benefits through incentives, cost reductions, mitigation and adaptation.

- Inventory & Monitoring – Develop or improve Inventory & monitoring to track progress toward the 2020 target, and ensure changes will be detected, including ways to determine current carbon contributions/ outputs of existing programs. The existing carbon inventory supporting the AB32 scoping plan utilized the best available information, but has significant limitations in terms of the accuracy of the estimate and the transparency of the methods used. A credible inventory and monitoring program is a fundamental component to managing forest carbon. The Board will form an interagency task group to develop the procedures to most efficiently conduct carbon accounting and monitoring of emissions. The fusion of approaches and use of existing programs will be given priority in meeting statewide accuracy objectives. The effort will attempt to address a system applicable to both public and private lands.
- Funding Reforestation – Work with Federal entities to increase funding available for reforestation of federal lands and for fuels management treatment to reduce the risk of wildfire. With the increased number of wildfires in recent years there is an increasing backlog in the number of acres of forest land that need for reforestation. A significant investment may only provide minimal benefits in the short term (2020), but will provide substantial benefits for 2050.
- Wood Utilization – Continued efforts to increase utilization of lower value biomass to enable treating more acres with fuel hazard reduction and reduce risk of wildfire. A specific action item will be to coordinate with the Energy Commission on the implementation of AB118 to encourage the development of bio-energy projects from forest biomass.
- Barrier Reduction – Reduce barriers and provide additional incentives for voluntary action by landowners. There is a real concern that additional financial burdens placed on landowners will create a disincentive for landowners to participate in carbon markets. To keep forest lands as working forests the Board of Forestry will consider the special needs of landowners. This may include considering changes to rules, simplifying the tracking and reporting of forest carbon...
- Public Outreach – Expand education and public outreach to encourage landowner participation. Given the long life cycle of forest stands many of the actions will require educating the public on the need for managing forests in ways that produce positive climate benefits. This includes both actions taken to sequester additional carbon and actively managing lands to reduce emissions from wildfire.
- Governmental Collaboration – Work with other agencies, commissions and the Legislature to ensure policies, infrastructure and funding to support fuels reduction and biomass utilization. Forests provide a range of benefits and environmental services. Multiple agencies have concern and oversight of forest resources and collaboration is needed to ensure that management actions consider the potential climate impacts or benefits from government programs and policies. In addition, strategic planning that includes both private and federal lands is needed to develop an effective approach for fuels reduction and biomass utilization.

APPENDIX B
BACKGROUND ON EMISSION REDUCTIONS REFERED TO
IN
BOARD OF FORESTRY AND FIRE PROTCTION AB 32 REPORT

Introduction: The Board of Forestry and Fire Protection is using the same basic information for this report as is relied upon by the Air Resource Board (ARB) in the Draft AB 32 Scoping Plan. The information was developed by the Department of Forestry and Fire Protection Technical Team who was assigned to prepare the information for ARB scoping plan. Following is a discussion of how the green house gas emission estimates were developed by the Technical Team and the references relied upon by the Team for that work. The assumptions used to project potential gains from forest sector progress were conservative and thus the actual carbon storage contributions are small. Another limiting factor was that research on development of an accounting protocol to capture the benefits of reducing wildfire emissions using fuel hazard reduction as a tool is not yet completed.

Urban Forestry GHG Emission Reductions -

References

California Energy Commission (CEC). 2004. Carbon Supply from Changes in Management of Forest, Range, and Agricultural Lands of California,. Report Prepared by Winrock International. PIER Final Project Report, March 2004. Report no. 500-04-068F.

California Energy Commission (CEC). 2005. Biomass Resources in California: Preliminary 2005 Assessment. Report Prepared by the California Biomass Collaborative. Contract no. 500-01-016.

California Energy Commission (CEC). 2006b. Bioenergy Action Plan for California. Report prepared by the Bioenergy Interagency Working Group, July 2006. Report no. CEC-600-2006-010.

California Energy Commission (CEC). 2006c. Recommendations for a Bioenergy Plan for California. Report to the Bioenergy Interagency Working Group. Navigant Consulting, April 2006. Report no. CEC-2006-004-F.

California Integrated Waste Management Board. 1995. 1995 Annual Update Nonyard Wood Waste Report. Available at <http://www.ciwmb.ca.gov/publications/organics/44395026.doc>.

Maco, S.E; McPherson, E.G.; Simpson, J.R.; Peper, P.J.; Xiao, Q. City of Berkeley, California: Municipal Tree Resource Analysis. USDA Forest Service, Pacific Southwest Research Station, Center for Urban Forest Research. 2005.

McPherson, E.G., J.R. Simpson, P.J. Peper, Q. Xiao, D.R. Pittenger and D.R. Hodel. Tree guidelines for Inland Empire communities. USDA Forest Service, Pacific Southwest Research Station, Center for Urban Forest Research. 2001.

McPherson, E.G., J.R. Simpson, P.J. Peper, K.I. Scott and Q. Xiao. Tree guidelines for coastal Southern California communities. USDA Forest Service, Pacific Southwest Research Station, Center for Urban Forest Research. 2000.

McPherson, E.G., J.R. Simpson, P.J. Peper and Q. Xiao. Tree guidelines for San Joaquin Valley communities. USDA Forest Service, Pacific Southwest Research Station, Center for Urban Forest Research. 1999.

McPherson, E.G. and J.R. Simpson. Potential Energy Savings in Buildings by an Urban Tree Planting Programme in California. Urban Forestry and Urban Greening, 2003: 73-86.

U.S. Department of Energy, Energy Information Administration (USDOE EIA). Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings. April 1998.

USDA Forest Service, Pacific Southwest Research Station, Center for Urban Forest Research. "Air Pollution Control – The Tree Factor." Urban Forest Research. January 2005.

USDA Forest Service, Pacific Southwest Research Station, Center for Urban Forest Research. "Green Plants or Power Plants?"

Conservation Forest Management GHG Emission Reductions -

References

Brown, S., A. Dushku, T. Pearson, D. Shoch, J. Winsten, S. Sweet, and J. Kadyszewski. 2004a. Carbon Supply From Changes In Management of Forest, Range, and Agricultural Lands of California. Publication Number: 500-04-068F. Winrock International, for the California Energy Commission, PIER Energy-Related Environmental Research, March 2004.

Brown, S., T. Pearson, D. Shoch, M. Delaney, and A. Dushku. 2004b. Baseline Development and Estimation of Carbon Benefits for Change in Forest Management In Two Regions In California: Blodgett Forest Research Station and Jackson State Demonstration Forest. Changing from Even-Age Management with Clearcuts to Uneven-Age Management with Group Selection Harvests. Publication Number: 500-04-070F. Winrock International, for the California Energy Commission, PIER Energy-Related Environmental Research, March 2004.

Brown, S., T. Pearson, A. Dushku, J. Kadyszewski, Y. Qi. 2004c. Baseline Greenhouse Gas Emissions for Forest, Range, and Agricultural Lands In California. Publication Number: 500-04-069. Winrock International, for the California Energy Commission, PIER Energy-Related Environmental Research, March 2004.

Dixon, G.E. 1999. ICASCA Variant (Inland California / Southern Cascades) Forest Vegetation Simulator. USDA Forest Service. 41.

Landscape Management System. 2008. University of Washington, College of Forest Resources.

Lindquist, J.L. 2004. Precommercial stocking control of coast redwood: a seventeen-year status report (1981-1998). California Forestry Report No. 2, State of California, The Resources Agency, Department of Forestry and Fire Protection. Pp. 29.

Lippke, B., J. Wilson, J. Perez-Garcia, J. Bowyer, and J. Meil. 2004. CORRIM: Life-cycle environmental performance of renewable building materials. Forest Products 54(6):8-19.

Smith, J.E., L.S. Heath and J.C. Jenkins. 2003. Forest volume-to-biomass models and estimates of mass for live and standing dead trees of U.S. forests. USDA-FS General Technical Report NE-298.

York, R.A. and Heald, R.C. 2005. Effort of pruning and its influence on growth of mixed-species plantations at Blodgett Forest, CA. Presentation at 2005 Blodgett Research Workshop (4th February 2005). In Blodgett Forest Research Workshop 2005 Abstracts Presentation, page 55.

Conservation (avoided deforestation) GHG Emission Reductions –

References

Fire and Resource Assessment Program (FRAP). 2003. The Changing California: Forest and Range 2003 Assessment. California Department of Forestry and Fire Protection. 198 pp. (http://frap.fire.ca.gov/assessment2003/Assessment_Summary/assessment_summary.html)

Giusti, Gregory. 2006. North Coast Hardwood Advisor/Forest and Wildland Ecology Advisor, University of California Cooperative Extension, Ukiah, CA. Personal communication.

Pearson, Tim. 2007. Winrock International. Personal communication.

Smith, J.E., L.S. Heath, and P.B. Woodbury. 2004. How to estimate forest carbon for large areas from inventory data. *Journal of Forestry* 102(5):25-31.

Stewart, Bill. 2006. Chief of Forest and Resource Assessment Program, California Department of Forestry and Fire Protection. Personal communication.

US Forest Service. 2007 Forest Inventory Analysis update (<http://www.fia.fs.fed.us/program-features/rpa/>)

Waddell, K.L., and T.M. Barrett. 2005. Oak Woodlands and Other Hardwood Forests of California, 1990s. USDA Forest Service, Resource Bulletin PNW-RB-245:94.

Reforestation GHG Emission Reductions -

References

Brown, S., A. Dushku, T. Pearson, D. Shoch, J. Winsten, S. Sweet, and J. Kadyszewski. 2004a. Carbon Supply from Changes in Management of Forest, Range, and Agricultural Lands of California. Publication Number: 500-04-068F. Winrock International, for the California Energy Commission, PIER Energy-Related Environmental Research, March 2004.

Brown, S., T. Pearson, A. Dushku, J. Kadyszewski, Y. Qi. 2004b. Baseline Greenhouse Gas Emissions for Forest, Range, and Agricultural Lands In California. Publication Number: 500-04-069. Winrock International, for the California Energy Commission, PIER Energy-Related Environmental Research, March 2004.

Brown, S., T. Pearson, S. Walker, K. MacDicken, and D. Shoch. 2005. Methods manual for measuring terrestrial carbon. Winrock International, 41 pp.

Dixon, G.E. 1999. ICASCA Variant (Inland California / Southern Cascades) Forest Vegetation Simulator. USDA Forest Service. 41.

Landscape Management System. 2008. University of Washington, College of Forest Resources.

Fuels Management / Bio-energy GHG Emission Reductions –**References**

- Batty, W.; Batty, R. 2002. *Development of Emission Inventory Methods for Wildland Fire*. Final Report to US EPA. Contract # D205-01.
- Brown, S., A. Dushku, T. Pearson, D. Shoch, J. Winsten, S. Sweet, and J. Kadyszewski. 2004. *Carbon Supply From Changes In Management of Forest, Range, and Agricultural Lands of California*. Publication Number: 500-04-068F. Winrock International, for the California Energy Commission, PIER Energy-Related Environmental Research, March 2004.
- California Energy Commission (CEC). 2005. *Biomass Resource Assessment In California in Support of the 2005 Integrated Energy Policy Report, Prepared by the California Biomass Collaborative*, California Energy Commission Report number CEC-500-2005-066-D, April 2005.
- California Energy Commission (CEC). 2006. *Bioenergy Action Plan for California, prepared by The Bioenergy Interagency Working Group*, California Energy Commission Report number CEC-600-2006-01.
- California Energy Commission (CEC). 2006c. *Recommendations for a Bioenergy Plan for California. Report to the Bioenergy Interagency Working Group*. Navigant Consulting, April 2006. California Energy Commission Report number CEC-2006-004-F.
- California Energy Commission (CEC). 2006d. *A Roadmap for the Development of Biomass in California. Draft for Discussion*. Prepared by the California Biomass Collaborative, PIER Collaborative Report. California Energy Commission Report number CEC-500-2006-095-D.
- California Forest Improvement Program (CFIP). 2005. *CFIP Users Guide*, 2005 Edition, Vol. 1.
- California State Board of Forestry. 1996. *California Fire Plan: A Framework for Minimizing Costs and Losses from Wildland Fires*. California State Board of Forestry, Sacramento. 104p.
- Davis, F.W., D.M. Stoms, A.D. Hollander, K.A. Thomas, P.A. Stine, D. Odion, M.I. Borchert, J.H. Thorne, M.V. Gray, R.E. Walker, K. Warner and J. Graae. 1998. *The California Gap Analysis Project - Final Report*. University of California, Santa Barbara, CA.
- Dushku, A., S. Brown, T. Pearson, N. Martin, S. Petrova, J. Winsten, S. Grimland, and J. Kadyszewski. 2005. *Carbon Sequestration through Changes in Land Use in Oregon: Costs and Opportunities*. California Energy Commission, PIER Energy-Related Environmental Research.
- International Energy Agency (IEA). 2004. *Biofuels for Transport: An International Perspective*.
- Reinhardt, E.; Keene, R.; and Brown, J. 1997. *First Order Fire Effects Model: FOFEM 4.0, User's Guide*. USDA Forest Service, Intermountain Research Station, General Technical Report INT-GTR-344.
- USDA Forest Service Research & Development/Western Forestry Leadership Coalition. 2003. *A Strategic Assessment of Forest Biomass and Fuel Reduction Treatments in Western States*.